JOB AID - ALTIMETRY SYSTEM ERROR-REPORT (ASE-R)

A. Purpose. (Operator's responsibility) to conduct Reduced Vertical Separation Minimum (RVSM) operations safely and to use approved aircraft meeting RVSM performance requirements.[1]

B. Objective. (FAA's oversight responsibility) determine if the operator's RVSM performance:

1) Meets the requirements of the Code of Federal Regulations (14 CFR) and FAA policies; and
2) notify the operator if an aircraft is approaching or exhibiting unsatisfactory height keeping performance.

C. References.

1) Title 14 CFR part 91, section 91.180, Operations within airspace designated as Reduced Vertical Separation Minimum airspace.
2) Title 14 CFR part 91, Appendix G, Operations in Reduced Vertical Separation Minimum Airspace.
3) Title 14 CFR part 91, section 91.706, Operations within airspace designed as Reduced Vertical Separation Minimum airspace (outside U.S.).
4) FAA Order 8900.1, Flight Standards Information Management System (FSIMS), volume 4, chapter 1, section 5, paragraph 4-109H, RVSM Monitoring Programs.

D. General. Safe operation within Reduced Vertical Separation Minimum (RVSM) airspace requires measurement of aircraft altitudes within stringent tolerances. Differences, known as altimetry system error (ASE) occur between the altitude indicated by the altimeter and the actual pressure altitude corresponding to the undisturbed ambient pressure the aircraft is operating at. Since the altimeter displays a level that includes ASE the presentation to the pilot, ATC, and airborne collision avoidance systems is not the actual height of the aircraft. These errors are not apparent during flight operations. To be compliant with regulatory standards, the ASE of an aircraft must be minimized and be no greater than 245 ft. Aircraft with observations of ASE greater in magnitude than 245 ft are candidates for removal of RVSM credentials and subject to immediate action.

Continued safe RVSM operations require a high level of accuracy from altimetry systems; therefore, ongoing system performance monitoring as well as individual aircraft performance monitoring are necessary to ensure that safety goals and requirements are met. In order to support monitoring needs in accordance with international standards, requirements and recommended practices the Federal Aviation Administration (FAA) deployed seven ground-based height monitoring units, also known as Aircraft Geometric Height Measurement Element (AGHME) systems, in the North American Region. These monitoring systems were strategically placed in high traffic flow areas and continuously record aircraft performance data.

Aircraft are monitored by the AGHME systems and those found to exhibit large ASE, with a magnitude greater than 200 ft, are investigated by the William J. Hughes FAA Technical Center Quality

[1] 14 CFR Appendix G to Part 91

Control Team in conjunction with the North American Approvals Registry and Monitoring Organization (NAARMO). This group determines if a Altimetry System Error-Report (ASE-R) should be generated to notify the operator and Federal Aviation Administration (FAA) Flight Standards Service Headquarters (AFS-470 and AFS-360) that an aircraft is exhibiting unsatisfactory height keeping performance.

Table 1 – PTRS

As applicable	Other
Operations	1413
Maintenance	3413
Avionics	5413

E. Tasks. (See Attachment A – ASE-R Flow Chart)

1) The NAARMO, administered through the FAA Separation Standards Analysis Branch, ANG-E61, FAA William J. Hughes Technical Center, will:

   a) Generate an ASE-R if an aircraft exhibits deteriorating performance and/or ASE greater than 200 ft;

   b) Notify and coordinate the ASE-R with FAA Flight Standards Service Headquarters (HQ), AFS-470, AFS-360, and the operator's Certificate-Holding District Office (CHDO);

   c) track the ASE-R progress and evaluate follow-up monitoring as required;

   d) notify the operator's CHDO and AFS-470 and AFS-360 of satisfactory or unsatisfactory follow-up monitoring results via the ASE-R Resolution Form; and

   e) close the report upon satisfactory resolution.

NOTE: Aircraft performance with ASE greater than 245 ft may warrant consideration of immediate suspension of RVSM operations until further investigation can be conducted. In this situation, coordinate with AFS-470 and AFS-360 and the operator's CHDO.

2) Flight Standards Service Headquarters, AFS-470, will:

   a) Review the ASE-R and in coordination with AFS-360, notify AFS-220 or AFS-820 as applicable;

   b) coordinate with AFS-360, NAARMO, and the operator's CHDO to assist the operator in developing a corrective plan of action;

   c) track the ASE-R progress as required; and

   d) in the case of unsatisfactory resolution, or ASE greater than 245 ft, coordinate with the operator's CHDO to determine if suspension of RVSM operations is warranted.

3) Servicing Certificate Holding District Office (CHDO):

a) Notify the operator via the ASE-R and, if necessary, coordinate with the NAARMO, AFS-470 and AFS-360, and the operator to assist in developing operator corrective plan – plan expected within 15 days of operator notification;

b) review and, if satisfactory, accept the operator's corrective plan - operator has 30 days from plan acceptance for corrective action to occur;

c) submit the ASE-R Resolution Form to NAARMO; and

d) monitor ASE-R progress. If the initial results are satisfactory, notify the operator and recommend closing the report. If the resolution is unsatisfactory, coordinate with NAARMO, AFS-470 and AFS-360 to determine next action.

NOTE: Suspension of RVSM operations should be coordinated with AFS-470 and AFS-360 with input from NAARMO.

NOTE: An operator's corrective plan requires definitive action including having the aircraft re-monitored.

F. Attachments.

1) ATTACHMENT A - ASE-R Flow Chart.

2) ATTACHMENT B - ASE-R Cover Letter.

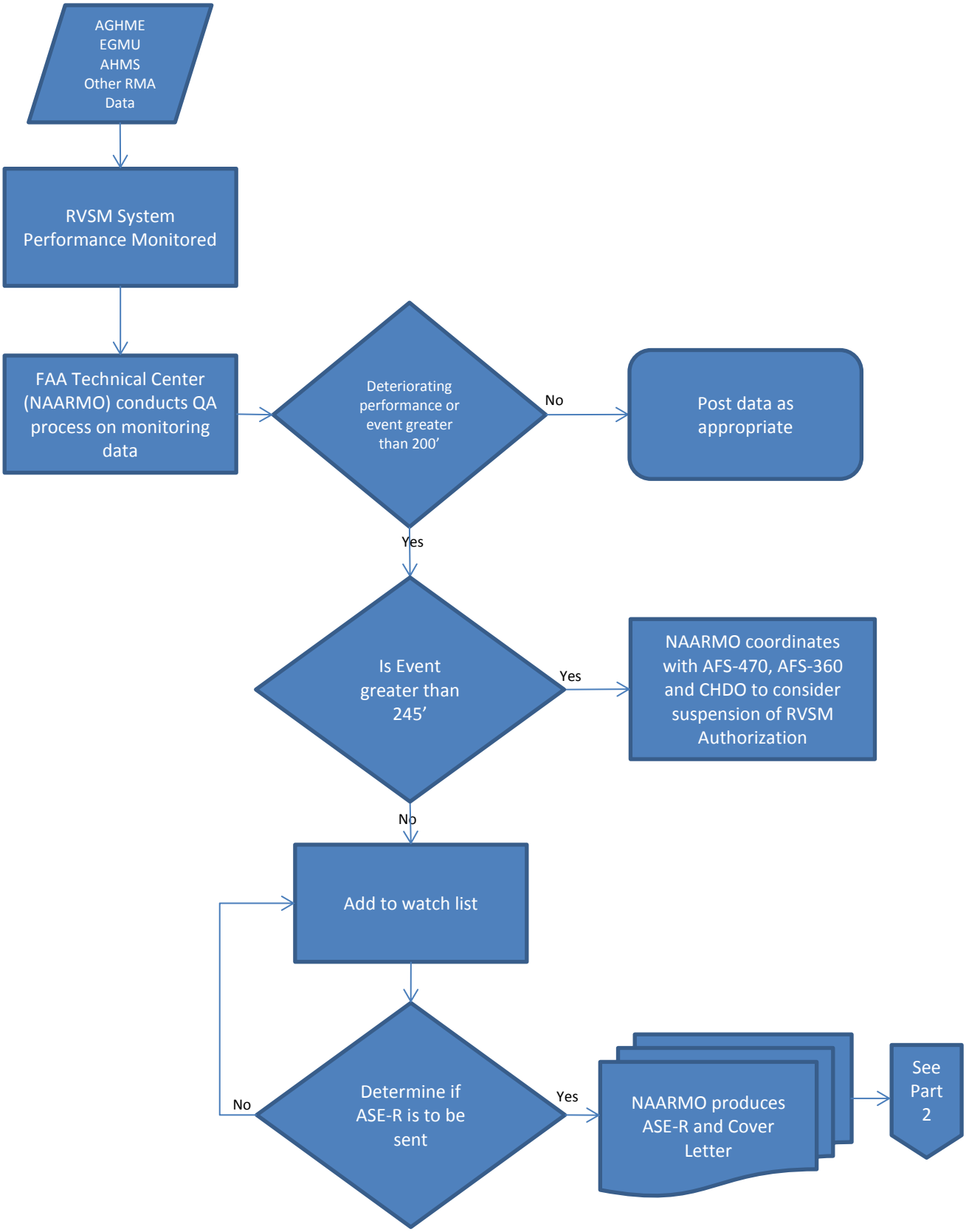
3) ATTACHMENT C - ASE-R Report (Sample).

4) ATTACHMENT D - ASE-R Resolution Sheet.

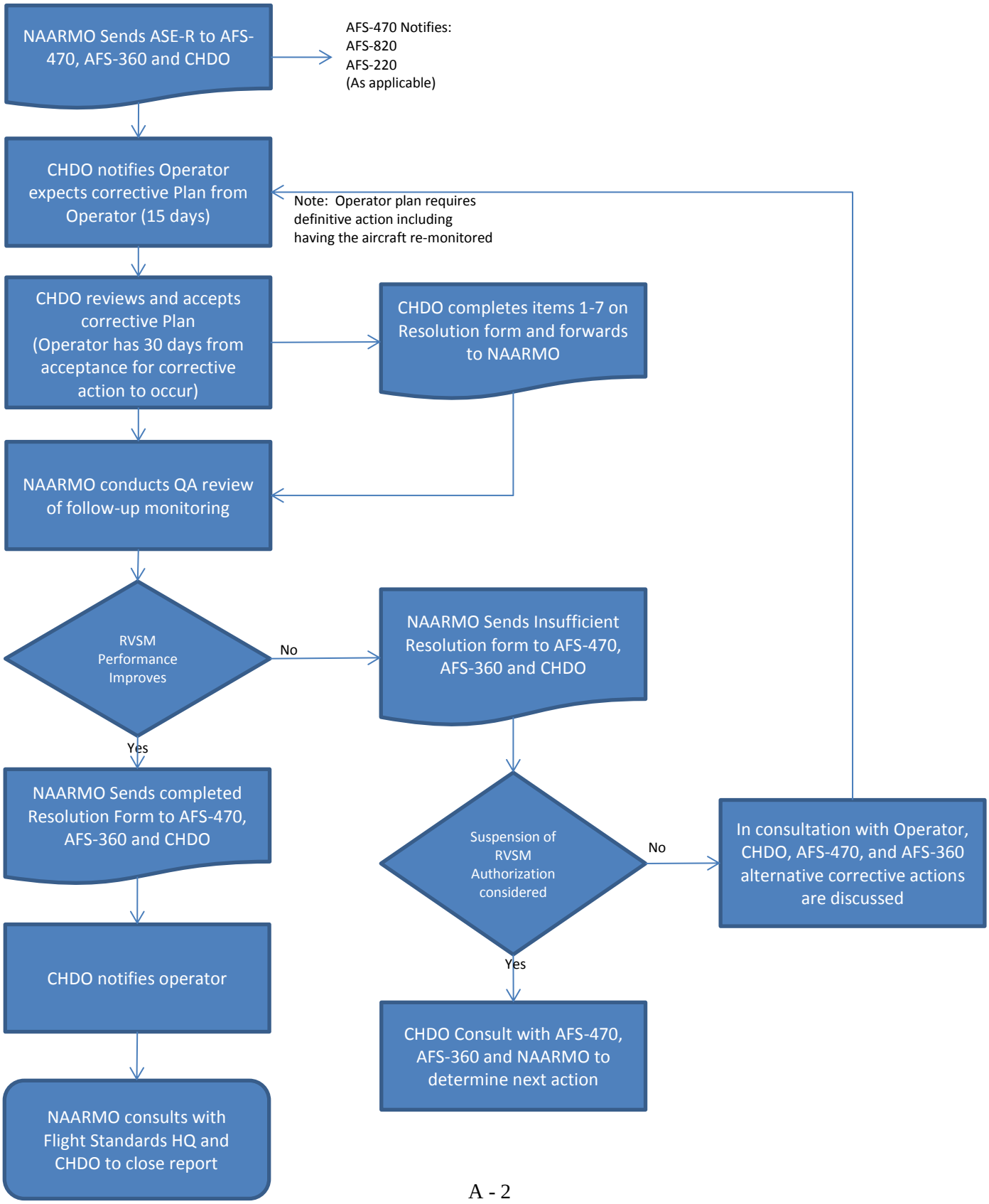
ATTACHMENT A

10/07/2014

Altimetry System Error-Report (ASE-R)
Process Flow Chart (Part 1)



Altimetry System Error-Report (ASE-R)
Process Flow Chart (Part 2)



ATTACHMENT B

10/07/2014

Altimetry System Error (ASE)-Report – Cover Letter

Dear Inspector:

Please review the enclosed Altimetry System Error (ASE)-Report dated XX XXX XXXX provided by the North American Approvals Registry and Monitoring Organization (NAARMO). It reports unsatisfactory height keeping performance by Aircraft with Registration Number Nxxxxx. This aircraft is pertinent to Operations Specifications/Management Specifications/Letter of Authorization issued to XXXXXXXX.

The data in this report indicate that the aircraft is not in compliance with 14 CFR Part 91.180 and Appendix G of the same part.

To prevent revocation or restriction of Operations in Reduced Vertical Separation Minimum (RVSM) Airspace, the operator must provide its principal operations inspector (POI) a plan by which the aircraft's altimetry system error will be corrected within thirty (30) days of FAA acceptance of the plan. That plan should be submitted by the operator within 15 business days of receipt of the report. Please note a Resolution Form is attached.

It is important that you address this serious safety issue promptly. If you have questions, please contact NAARMO at NAARMO@faa.gov

Thank you,
NAARMO

Altimetry System Error (ASE)-Report

Date: MMM DD, YYYY
Control Number: ASE-R0XX

To:
POI Name, POI
Address Line 1
Address Line 2
Oper – Operator Name
Subject Aircraft Registration: NXXXXX

Prepared By:
North American Approvals Registry
and Monitoring Organization
Federal Aviation Administration
Atlantic City International Airport
Atlantic City, NJ 08405

Safe operation within Reduced Vertical Separation Minimum (RVSM) airspace requires stringent limits on the measurement of true aircraft altitudes during normal operations. Aircraft use a barometric altimeter to determine altitude and follow common pressure/flight levels. Differences between the altitude indicated by the altimeter display and the actual pressure altitude corresponding to the undisturbed ambient pressure, known as altimetry system error (ASE), occur. These errors are not apparent during flight operations. Therefore the altimeter displays to the aircrew and air traffic control a level that includes ASE. As such, the presentation to the pilot, ATC, and airborne collision avoidance systems is often different than the actual height of the aircraft. To be compliant with international standards, the ASE of an aircraft must be minimized and be no greater than 245 ft. Aircraft with observations of ASE magnitude greater than 245 ft are candidates for removal of RVSM credentials and subject to immediate action.

Continued safe RVSM operations require a high level of accuracy from altimetry systems; therefore ongoing system performance monitoring as well as individual aircraft performance monitoring are necessary to ensure that safety goals and requirements are met. In order to support monitoring needs in accordance with international standards, requirements and recommended practices [1] [2] [3], the Federal Aviation Administration deployed six ground-based height monitoring units, also known as Aircraft Geometric Height Measurement Element (AGHME) systems, in the North American Region. These monitoring systems were strategically placed in high traffic flow areas and continuously record aircraft performance data.

The subject aircraft has been monitored by one or more AGHME systems and was found to exhibit large ASE, values greater in magnitude than 200 ft. The William J. Hughes FAA Technical Center Quality Control Team in conjunction with the North American Approvals Registry and Monitoring Organization (NAARMO), tasked to provide Reduced Vertical Separation Minimum (RVSM) monitoring services to other Regional Monitoring Agencies (RMA) and State Authorities, cite ASE data collected in Tables 1-2 and Figures 1-4 as reason for safety concern.

Section I: Subject Aircraft and ASE Measurement Overview

Table 1. Aircraft Profile

Operator:	Operator Name
Registration Number/Mode S Address:	NXXXXX / ModeSAddress
Aircraft Type/Series/Serial Number:	Cessna C560 / 560 / SN
RVSM Ops Date, Expiration Date:	5/12/2008, None.
Equipment ID Field:	L
Large Recent Monitored Measurement(s):	a) ACLE 6/21/2012 ASE = 285 feet
	b) APHX 8/11/2012 ASE = 267 feet
	c) ACLE 10 /11/2012 ASE = 274 feet
GMS#, Date GMS Monitored (MM/DD/YY):	N/A
European Monitored:	N/A

Section II: Data Analysis and Performance Summary

The following table and figures provide a summary of aircraft ASE performance and comparative data. Table 2 provides a summary of aircraft performance recorded during a recent period.

Table 2. Recent ASE Performance of Subject Aircraft

AGHME Identification	Date of Measurement	ASE	Flight Level
AICT	01-Jun-12	218	400
ACLE	19-Jun-12	102	410
ACLE	21-Jun-12	285	330
ACLE	29-Jun-12	193	410
ACLE	08-Jul-12	190	410
ACLE	08-Jul-12	180	410
ACLE	11-Jul-12	157	410
APHX	11-Aug-12	267	390
ACLE	15-Aug-12	183	300
ACLE	07-Sep-12	78	400
AACY	24-Sep-12	179	290
ACLE	08-Oct-12	161	410
ACLE	11-Oct-12	274	390
APHX	09-Apr-13	138	410
APHX	11-Apr-13	111	400

Figure 1 provides an overview of this aircraft's ASE performance at each AGHME element during a recent period.

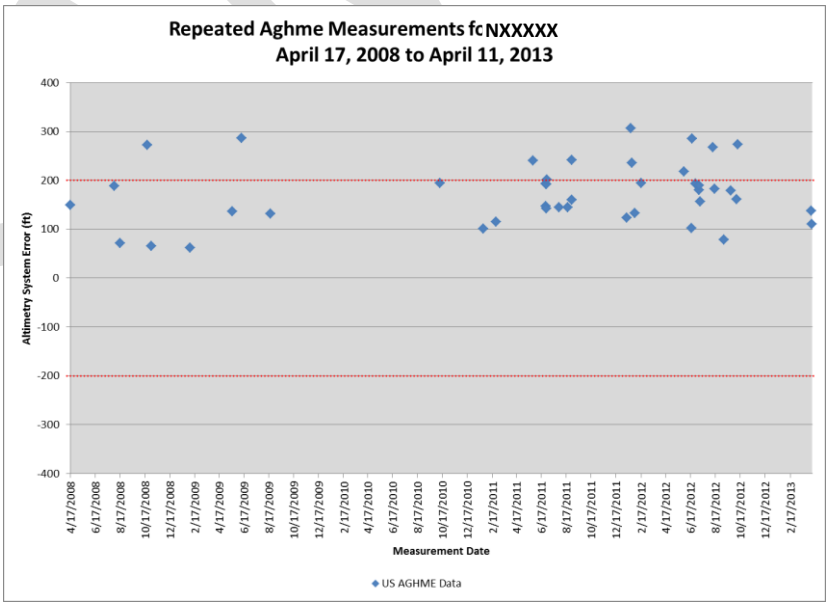


Figure 1. Aircraft Altimetry System Error History

Figure 2 provides a depiction of daily ASE observations from a single AGHME site on the day of the maximum observation of the subject aircraft.

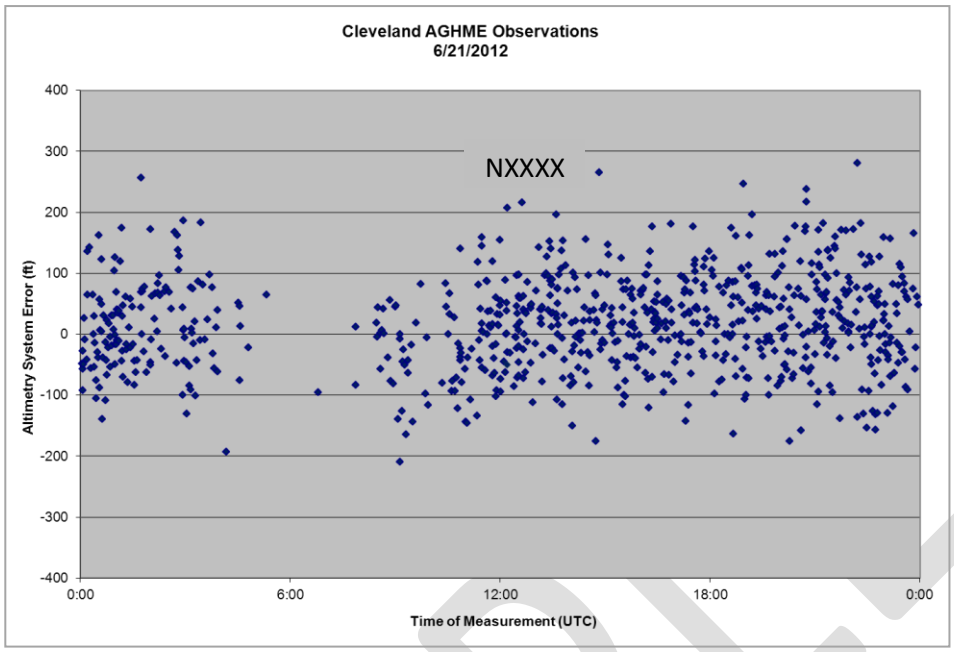


Figure 2. Cleveland AGHME Observations Illustrating an Extreme Observation of the Subject Aircraft

Figure 3 is a comparison of the average ASE performance of aircraft of a similar type.

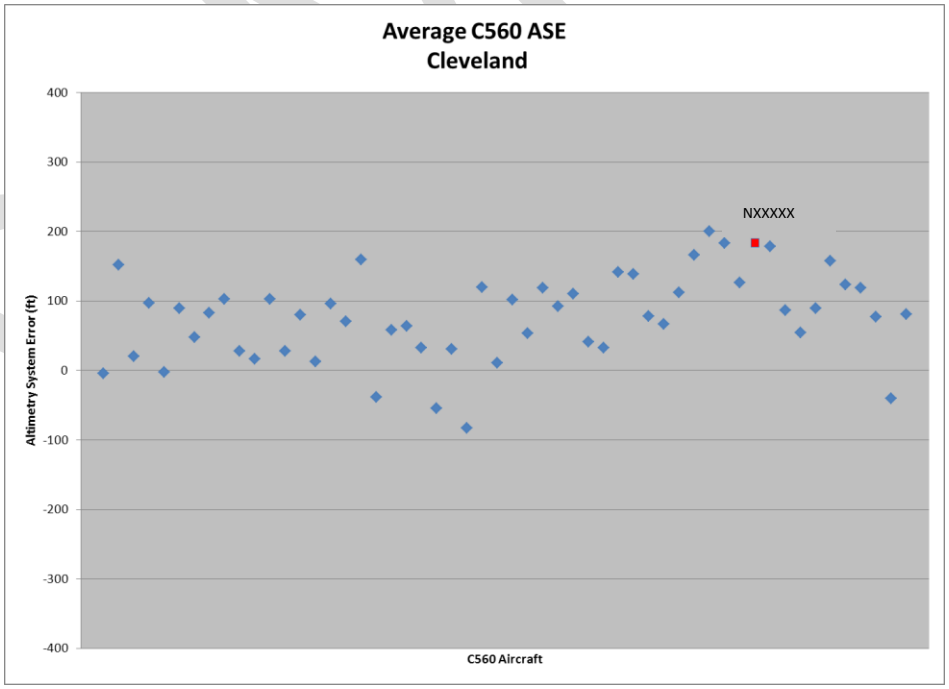


Figure 3. Average C560 ASE at Cleveland for the Past Year

Figure 4 illustrates the probability (99.7%) that the ASE of a C560 aircraft will take a value within the expected range for this aircraft type.

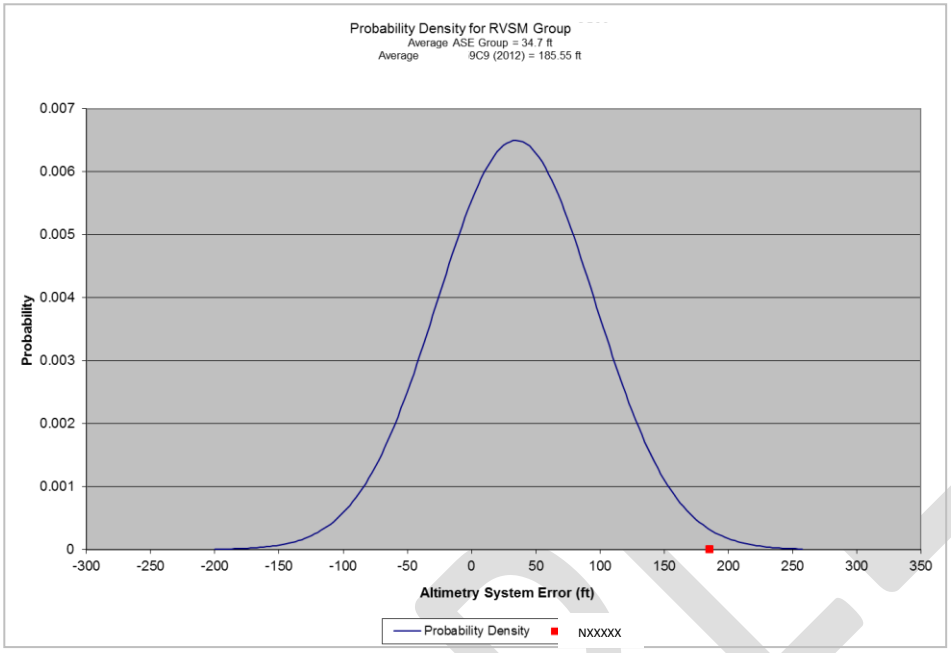


Figure 4. Probability Density for RVSM Group XXXX

Section III: Continuing Maintenance Issues

During routine calibration, the aircraft systems are maintained on the ground while at rest, so the dynamic nature of ASE is not apparent.

Aircraft altimetry systems also utilize parts that:

- wear over time (such as the pitot-static probe and portions of internal plumbing); and/or
- are subject to damage (such as skin flexing/deformation during operations); and/or
- are affected by modification of airframes (such as the application of paint, decals and branding marks or mounting of accessories or repairs such as boiler plating in the vicinity of the static pressure ports).

Aircraft must operate within RVSM limitations as published in the Aircraft Flight Manual (AFM).

All these activities are capable of producing significant error in true height. Other factors seen in normal operations of high-speed flight such as aerodynamic loading and exposure to ranges of temperature, moisture and contaminants, are also capable of producing significant variation in the sensed pressure.

Section IV: Action Required

Because of this larger than normal or non-compliant value, it is necessary to determine and remedy the cause or causes of non-compliant performance by the altimetry system and then repeat the monitoring process in order to demonstrate compliant performance. Prior to repeating the monitoring flight, the operator should ensure up-to-date compliance with the approved maintenance program, carefully inspect the aircraft altimetry system critical areas and review all relevant factors in order to determine any possible explanations for the observed ASE value.

Please complete the attached resolution form and submit to NAARMO@faa.gov or fax to 609 485-5078 within 15 days or less of receipt of this report. Please note the aircraft's altimetry system error must be corrected within thirty (30) days of FAA acceptance of the resolution plan.

ATTACHMENT D

10/07/2014

Altimetry System Error (ASE)-Report - Resolution Form

Please complete Sections 1-7 below and submit completed form to NAARMO@faa.gov or fax to 609 485-5078.

1. Date:	2. Control#:	3. Completed By:

4. Operator Information:		
Operator Name:	Operator Code:	
Contact Name:		
Address:		
Phone #:	Cell #: (optional)	Fax #: (optional)
Email:		

5. Aircraft Information:			
Aircraft Type:	Series:	Serial #:	Registration #:

6. Operator Action (Please include dates):
Attach Operator Action Plan as applicable

7. Operator Follow-up Height Monitoring Plan:		
Date:	Proposed Method:	Location:

8. Flight Standards Acceptance:	
Name:	Organization:
Signature:	

**** The Sections Below are to be Completed by NAARMO ****

9. Follow-up Monitoring :		
Date:	Method:	ASE Value:

10. Reviewing NAARMO Official:

Reviewer Name:

Organization:

Email: Phone:

Signature: _____

Resolution Satisfactory?: ☐ Yes ☐ No

Report Closed?: ☐ Yes ☐ No Date:

11. Reviewer's Comments